

THE NATIONAL WILDLIFE RESEARCH CENTER

RESEARCH UPDATE

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Wildlife Services – Vision and Strategic Goals

The Wildlife Services (WS) program provides federal leadership in managing problems caused by wildlife. Four important goals have been identified as part of WS strategic plan to improve the coexistence of people and wildlife: Developing Methods, Providing Wildlife Services, Information and Communication, and Valuing and Investing in People. This NWRC Update contains short summaries of selected NWRC research activities supporting these goals and covers October 1, 2003 to May 31, 2004. A more comprehensive description of the NWRC's research and related activities is covered in the Center's annual "Innovative Solutions to Human-Wildlife Conflicts Accomplishments" report, which is available on the NWRC website (<http://www.aphis.usda.gov/ws/nwrc/pubs.>)

Invasive Species Research

Invasive species have long posed numerous threats to the country's natural environment, but only in recent years have these issues received the attention they deserve. One reason invasive species research is now recognized as an important, even vital, part of resource management nationwide is the issuance of Executive Order 13112 by President Clinton on February 3, 1999. The Order authorized the National Invasive Species Council to "prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause." However, NWRC scientists have been involved in invasive species research and management for many years. This article briefly summarizes a few of the Center's efforts in this important area of protecting America's natural resources.

Seabird colonies once flourished on Kiska Island in the Aleutians. Now, hundreds of thousands of auklet nestlings hatch — only to become meals for hordes of voracious Norway rats. To help improve survival of auklets and other seabirds, NWRC recently cooperated with the U.S. Fish and Wildlife Service (USFWS) in a study to develop methods for eradicating the rats from the island. If rodent control efforts can be sustained, auklets may once again thrive on the island.



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The rodent work on Kiska Island is only one of several invasive species efforts in which NWRC is involved. Invasive mammal problems are so varied and extensive that the NWRC has committed to a new research project, headed by Dr. Gary Witmer. The project will focus on mid-size mammals such as rats, nutria, and mongoose.

“Some of the research will be conducted on islands,” notes Witmer, “but other research will be conducted at mainland locations including the NWRC headquarters research facilities. For example, there’s been a black rat outbreak in Arizona. Black rats normally appear coastally or on islands, but these have invaded citrus orchards.”

“Invasive species issues are receiving a lot of public attention and funding,” says Witmer. “For instance, we are about to break ground on an invasive species research building (ISRB).” Construction on the new ISRB will begin in early 2005 and be finished in mid-2006.

“The ability to generate tropical climates in animal rooms is a unique feature of the new ISRB,” says Bill Dusenberry, NWRC facilities planner. “The current NWRC Animal Research Building is more suited to temperate climate studies. Another nice feature of the new ISRB is that whatever climate may be used in one room shouldn’t affect the climate in the adjoining room.” While the facility will have two large simulated natural environment chambers, a variety of room sizes will give researchers more design flexibility. Additionally, there will be an X-ray suite for research/animal care. Total size of the building will be about 25,000 sq ft.

The new building will enhance NWRC’s ability to research a variety of approaches to invasive species problems including developing detection and monitoring systems and ship-response plans to prevent invasive species from becoming established in new locations, controlling established invasive species as soon as possible after introduction, capturing animals through the use of better trapping systems, and employing integrated management strategies to lower populations of species that cannot be eradicated.

One of the most important ongoing NWRC invasive species research projects involves the brown treesnake on Guam. NWRC research on brown treesnakes began in 1993 with funding from the U.S. Department of Interior, but since has been primarily funded by the Department of Defense (DoD) Legacy Resource Management Program, which was established in 1990 to fund the DoD’s efforts to enhance its stewardship on military lands.

The treesnake, native to Australia, the Solomon Islands, New Guinea and Indonesia, was most likely accidentally introduced to Guam through post World War II cargo shipments. It has since decimated most of the island's native terrestrial vertebrate populations. Management of the brown treesnake is aimed at preventing its dispersal through cargo, containing incoming snakes at destinations, reducing the population on Guam, reclaiming areas on Guam for reintroduction of native wildlife, and protecting power stations and other sensitive locations from intrusion.

NWRC brown treesnake research has focused on developing fumigants, toxicants, reproductive inhibitors, lures and attractants, and repellents to control these invasive snakes. Early fumigant work centered on methyl bromide. When methyl bromide was found to be an ozone reducer, attention shifted to sulfuryl chloride and magnesium phosphide. Data on these two fumigants are ready to submit to EPA for registration for use on treesnakes.

Another priority in brown treesnake work has been development of an oral toxicant. Initial work focused on pyrethrums (plant compounds used for controlling insects). Though some efficacy was achieved, a better toxicant was needed. Dr. Peter J. Savarie, perusing pet-trade literature, found warnings against feeding anti-inflammatories to snakes and set about investigating available compounds for their toxicity. He and other NWRC scientists showed that acetaminophen was highly toxic to brown treesnakes, even at low levels. Also, brown treesnakes, unlike many other snakes, will eat dead mice. Thus a bait consisting of mice, with acetaminophen inserted, was developed and registered with the U.S. Environmental Protection Agency (USEPA) as a toxicant delivery system.

Though use of mice baits is effective, work continues to develop an attractant to replace the dead mice as baits, as well as the live mice lures used in traps. In the attractants work, NWRC scientists have characterized the odor of dead and decomposing mice but have not been able to replace dead mice with a similar-smelling compound matrix that is an equally effective attractant as live mice.



The expansion of invasive species work at NWRC ensures that ever-increasing scientific expertise will be applied to development of practical methods to resolve problems caused by nonnative wildlife.

Repellents, like toxicants and attractants, have been investigated by NWRC scientists. They are important for driving snakes from areas where they can easily be concealed, such as cargo areas. “When Wildlife Services began working with snake-detecting dogs, if the dog indicated there was a snake in the cargo, there would be no easy way to get it out,” explains Dr. Kathleen Fagerstone, NWRC Research Program Manager. In a search for a repellent, Dr. Larry Clark’s research led to the use of natural oils (cinnamon oil, clove oil, and eugenol) for this purpose. When fumes from one of these oils are blown into cargo areas, snakes exit hiding places and can then be captured.

On another front, Dr. Tom Mathies is studying snake reproduction in hopes of developing reproductive inhibitors. An initial hurdle to overcome was getting the snakes to reproduce in captivity. Dr. Mathies successfully established a captive breeding program at NWRC headquarters and is now trying to understand reproductive hormones and breeding cycles. So far, studies have shown that, unlike females, males are reproductively active throughout the year in Guam and are the best candidates for sterilization.

NWRC scientists are researching solutions not only to brown treesnake problems, but also to other species of immediate concern to WS, including coqui frogs (invasive Caribbean tree frogs that are now spreading in Hawaii), nutria (aquatic rodents expanding in Louisiana and Maryland and causing extensive damage to aquatic resources and wetland vegetation), mongooses (introduced into Hawaii to control rats, and now wreaking ecological havoc), monk parakeets (established in Florida and a few other places with resultant agricultural damage and power outages), and feral swine (a very large problem throughout the southern states and Hawaii). Feral swine not only damage the environment, but also carry some very serious diseases such as pseudorabies and swine brucellosis that haven’t been eliminated from livestock populations.

Scientific work conducted at NWRC is integral to overall invasive species management in the United States. “The Invasive Species Council has developed a national plan, with research being an important component,” said Witmer. “This thing is just kind of kicking into gear now with agencies trying to figure out responses, roles, and where the resources will come from.” Much of the NWRC’s invasive species work will be in collaboration with other federal agencies such as USFWS, the U.S. Geological Survey (USGS), and the National Park Service; state agencies; and tribal and territorial governments.

The expansion of invasive species work at NWRC ensures that ever-increasing scientific expertise will be applied to development of practical methods to resolve problems caused by nonnative wildlife. By reducing invasive species threats, the WS program and NWRC continue in their mission to protect American agriculture, environmental resources, human health and safety, and threatened and endangered species.




DEVELOPING METHODS

Evaluation of Coyote Capture Methods – The need for alternative predator capture techniques is increasing, as is the need for comparative data evaluating coyote capture methods. In an initial evaluation, biologists at the NWRC Logan, Utah field station surveyed wildlife managers for information on cage-trapping. Using these data, a field study was conducted of 4 coyote capture systems. The SoftCatch®, Collarum®, Wildlife Services-Turman (WS-T), and Tomahawk® systems were tested for capturing coyotes in Arizona and South Texas during 2001 and 2002. Field work was then conducted to determine capture efficiency and selectivity, and whole body necropsies were performed to identify trap-related injuries. Surveys indicated that coyotes were most often captured in large (> 1.6 m length) cage traps baited with meat or carcasses. In this field evaluation, the capture rate (percentage of coyote captures per capture opportunity) was 0% for the Tomahawk cage-trap, 87% for the Collarum, 88% for the WS-T throw arm, and 100% for the SoftCatch. Cage-traps were the least selective, capturing 34 non-coyote animals, and Collarums were the most selective, capturing no non-coyote animals. The WS-T and Soft Catch devices showed intermediate selectivity of 50% and 69%, respectively. All devices showed low injury scores relative to jawed devices in previous studies; 92%, 57%, and 92% of coyotes captured in the Collarum, WS-T, and Soft Catch showed no indication of injury, respectively.

Eradication of Coqui Frogs in Hawaii – Scientists from the NWRC, Hilo field station and WS Operations teamed up with personnel from the Hawaii Department of Agriculture, Hawaii Department of Land and Natural Resources, Kauai Invasive Species Committee, University of Hawaii Agricultural Extension Service, private forest management consultants, and private landowners in an attempt to eradicate the known population of the coqui frogs from the island of Kauai. Frog call counts were conducted for a week prior to the eradication attempt and the population was estimated at about 80 males (only males call). The frog calls were also used to determine the acreage of the infestation and delineate treatment boundaries. In June of 2003, 14 people from various agencies gathered in a gulch in Lawai to treat approximately 3 acres inhabited by the coqui with a citric acid solution. Using high-pressure spray guns, approximately 1,200 gallons of citric acid solution were sprayed, drenching all the vegetation on the forest floor and in the lower canopy. Frog call counts conducted during the following week revealed only 5 or 6 males remained in the gulch. Spot treatment occurred in the following months to control the few remaining frogs. The impacts of citric acid on nontarget species was also evaluated. Invertebrate populations declined slightly immediately following the application but returned to pretreatment levels within 2 weeks. Because it is not known if the treatment reached all of the females or killed frog egg masses, state agencies and the island Invasive Species Committee will conduct repeat spot treatments periodically for a year to ensure complete eradication.

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Registered Fungicide and Insecticides Evaluated as Blackbird Repellents – In August 2003, NWRC scientists in Fort Collins, CO, evaluated the bird repellency of GWN-4770, a fungicide registered by the U.S. EPA for rice. Preference (or “choice”) testing among individual red-winged blackbirds indicated that 1% GWN-4770 reduced rice consumption by blackbirds more than 90% relative to a control group. In no-choice tests, consumption of rice treated with 1% and 2% GWN-4770 was reduced 37% and 78%, respectively. A small-scale field test of GWN-4770 was conducted in February 2004 near Gueydan, LA. Blackbird consumption of rice treated with 2% GWN-4470 was less than that within control plots. In cooperation with researchers at Southeast Missouri State University, 1% GWN-4770 was also evaluated as a seed treatment to reduce blackbird damage to drill-planted rice in April 2004. Compared to treated sites, blackbirds damaged over 40% of the rice seedlings on untreated sites. During September and October 2003, NWRC scientists at the Bismarck, ND, field station tested 5 insecticide formulations (Asana® XL, Baythroid® 2, Lorsban® -4E, Scout X-Tra®, and Warrior® T) currently registered for use on ripening sunflower. Birds’ consumption of Lorsban®-4E -treated sunflower seeds was reduced 82% compared to the control birds, whereas the other insecticides reduced consumption 0 to 26%. In a second trial, Warrior insecticide was tested at full-label rate and Lorsban was tested at varying concentrations. Scientists found that feeding was reduced at least 40% (compared to control birds) for all test groups. Lorsban-4E showed the best potential as a bird repellent in cage trials. Additional research is needed on the efficacy and environmental effects of Lorsban and other candidates before pursuing expansion of Lorsban-4E registration label as a bird repellent.

Commercial Manufacture of New Tools – NWRC scientists are working with a marketing group from Cheyenne, WY, to commercially produce a new audiovisual frightening device, a new roof rat bait delivery device, and a new electronic trap-check monitoring device. The frightening device is based on a system developed at the NWRC. The company is in the final stages of producing its first batch of the frightening devices for trial and use by NWRC scientists and WS field personnel. The system incorporates multisensory stimuli that repel both mammals and birds. The marketing group is working with NWRC Fort Collins, CO, and Hilo, HI, personnel on developing and manufacturing the roof rat bait system, and the prototype devices will be tested soon. Finally, progress was made in the development of trap monitors and the basic design features of prototype units designed to fit inside trap stakes.

Vulture Management Methods Research Review – On February 18, 2004, NWRC scientists from the Fort Collins, CO, headquarters, and the Sandusky, OH, and Gainesville, FL, field stations met in Christiansburg, VA, with biologists from Virginia WS to review progress on the NWRC Research Project, “Develop New or Improved Vulture Management Methods to Reduce Damage and Livestock Predation and Disperse Nuisance Roosts.” In addition, meeting participants visited nearby sites where NWRC researchers and WS biologists had trapped and tagged 200 black vultures (and equipped 20 with radio transmitters) to document black vulture use of an urban roost in Radford, VA, and black vulture activities on livestock ranches within the New River Valley. The findings of this study will help determine if dispersal of communal roosts can reduce black vulture use of nearby livestock operations.

Alpha-chloralose Field Trials on Starlings – Alpha-chloralose (AC) is a capture agent being investigated as an alternative control tool for managing starlings at livestock farms. Starlings feed on silage and protein supplements intended as livestock feed; defecate on structures, equipment, and animals; and may act as livestock disease vectors as they move among farms. In February, 2004, NWRC biologists, in cooperation with New York WS personnel, conducted field trials using AC to capture European starlings at dairy farms in upstate New York. Two farms with starling populations ranging from 1,000 to 5,000 birds were baited with AC. Approximately 30% of possible baited birds were captured. AC-affected birds were found up to 1 km from the bait site, but were found in diminishing frequency with increasing distance from the bait site. Mortality due to AC overdose was less than 10% of the captured birds. Snow cover was essential for locating affected birds as they often attempted to hide when AC began to impair their mobility. This operational scale experiment will be repeated and refined based on the results from these initial trials.

Western Redcedar Analysis For Deer Browse Deterrent – An NWRC scientist, working in cooperation with the British Columbia Ministry of Forests, completed analyses in late April 2004, of western redcedar foliage to identify whether increased levels of foliar terpenes deter deer browsing when trees with low levels of terpenes are also available for browsing. Samples were collected from trees in an operational progeny test plot that had undergone substantial browsing. Of the 18 significantly browsed trees (out of 82 trees sampled), 12 had extremely low levels of foliar terpenes. Of the 6 browsed trees with higher terpene concentrations, 4 also exhibited high carbohydrate levels in the foliage. The data further demonstrate that terpene levels are under genetic control while carbohydrates are not. These data suggest that genetic selection could be used in an integrated program to protect redcedar from deer browsing.

DRC-1339 as a Starling Control Method in Feedlots and Dairies – WS recently re-registered DRC-1339 in New York for use in feedlots and dairies and in February 2004, began using this avicide to reduce troublesome starling populations. NWRC scientists from the Bismarck, ND, and Sandusky, OH, field stations visited dairy farmers in upstate New York who are concerned about sanitation and disease (both in the barns and milk) and the impact on milk production from starlings eating high-quality dairy supplements. After pre-baiting with nontoxic bait, DRC-1339 was used at 3 dairy farms that had starling populations ranging from <1,000 to 8,000 birds. Starling populations declined by 40-90% the day following application. Baiting at 1 site seemed to benefit surrounding farmers. For example, personnel at a buffalo ranch about 5 miles north of a bait site retrieved numerous dead starlings the day after the baiting took place and subsequently reported fewer starlings after the baiting.

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Evaluating Management Strategies for Reducing Cormorant Damage to Natural Resources – In fall 2003, WS was granted expanded authority under new migratory bird management regulations to manage double-crested cormorants that impact aquaculture and natural resources. To ensure that wildlife managers understand the implications of different management strategies, NWRC biologists are working with the WS operational program to determine the behavioral responses of cormorants to different management activities. Biologists from the NWRC Starkville, MS, field station continued work initiated in 2003 in New York to evaluate cormorant responses to a myriad of nonlethal dispersal techniques aimed at discouraging these birds from using Oneida Lake before and after breeding, thereby reducing impacts to recreational fisheries. NWRC biologists, WS Operations biologists, and Michigan Department of Natural Resources biologists initiated a similar study in the Les Cheneaux region of Michigan in 2004 in response to localized depletions of harvest-sized yellow perch in the region. These biologists are collecting information on perch populations, cormorant habitat use, and cormorant reproductive parameters in specific bodies of water where perch problems have persisted. Information on these parameters will be combined with investigations of cormorant diet patterns and cormorant behavioral response to specific management strategies including egg-oiling, nest destruction, and limited control of adult cormorants. These studies will help determine the role of cormorants in perch depletion and whether cormorant management can effectively reverse these trends.



PROVIDING WILDLIFE SERVICES

FAA Interagency Agreement Signed – The Federal Aviation Administration (FAA) signed a new 5-year Interagency Agreement (IA) with WS in October, 2003, for fiscal years 2004-2008. Proposed research to be carried out under the new IA by the NWRC Sandusky, OH, field station relates to wildlife habitat management and land-use, wildlife damage management techniques, and avian sensory perception. This is the latest in a series of USDA-FAA IAs that started in 1991 and will allow NWRC to continue to play an important role in reducing the adverse impacts of wildlife to the aviation industry.

Vulture Assessment at Phoenix International Airport – During October 21-26, 2003, biologists from the NWRC Gainesville, FL, field station and the WS Arizona State Office assessed vulture hazards at Phoenix Sky Harbor International Airport and Gila Bend Auxiliary Air Force Base (GBAFB). Both sites regularly receive complaints of vultures in aircraft take-off and approach zones. An F-16 at GBAFB collided with a vulture in June and was lost. Recommendations for developing management strategies to reduce hazards included quantifying seasonal use of the area by vultures and identifying key roost sites that pose hazards to aircraft.

Bird Damage to Corn Seedlings in Hawaii – NWRC and other WS biologists traveled to Kauai in November 2003, to assess bird damage to corn seedlings in Waimea, west Kauai. Pioneer Seed, a subsidiary of DuPont, leases about 150-200 acres of agricultural land on the island and spends about \$100,000 each year to prevent bird damage to its corn, soybean, and sunflower fields. Pheasants, francolins, doves, pigeons and cardinals are the primary depredating species. Most damage occurs when the plants are newly sprouted. Pioneer hires “bird watchers” to sit in the fields and haze the birds. The WS biologists provided Pioneer with suggestions for management of bird populations in the area.

Population Demographics Model for Common Ravens – Scientists from the NWRC Sandusky, OH, field station, the NWRC in Fort Collins, CO, and the Nevada WS State Director met with biologists from the USGS Western Ecological Center (WERC) in San Diego, CA, on January 20, 2004 to discuss the development of a population demographics model for common ravens in the Mojave Desert. This model will help to evaluate the impact of WS management activities and to strengthen WS NEPA documentation. The model will allow scientists to evaluate the contribution of various parameters (e.g., age-specific annual survival) to raven population growth in the Mojave and the West, to identify data needs in understanding the species’ ecology relative to population growth, and to assess effects of time- and site-specific lethal control of ravens to protect desert tortoise and sage grouse, as well as to reduce damage to agricultural and livestock stakeholders.

East Mississippi Agriculture Expo Presentation – A biologist from the NWRC Starkville, MS, field station attended the East Mississippi Ag Expo on January 23, 2004, along with Mississippi and Alabama WS personnel. More than 200 people were

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in attendance, including the Mississippi governor and the head of the state legislature's appropriations committee. The NWRC scientist delivered a presentation addressing the role of research in reducing avian impacts to catfish aquaculture. The WS district supervisor presented updates on a recently amended depredation order for farmers participating in lethal control of double-crested cormorants to reduce aquaculture depredation. The event was organized by the Mississippi State University Cooperative Extension Service and supported by 33 sponsors and exhibitors.

Estimating the Efficacy and Benefit-Cost Ratios of Feral Swine Removal from the Last Remnant of a Basin Marsh System in Florida – Savannas Preserve State Park (SPSP) in Florida protects the last remnants of a basin marsh system that formerly extended for 200 miles along Florida's southeast coast. The rest has been lost to development. This park also supports a myriad of threatened and endangered plant and animal species. The exposed portions of the marsh had been severely damaged by feral swine. In January 2003, an NWRC biometrician worked in conjunction with WS Operations and the Florida Department of Environmental Protection to estimate the amount and value of the swine damage per hectare to the exposed portions of the basin marsh prior to implementation of swine removal. In January 2004, after 1 year of swine removal, the amount and value of damaged marsh were again estimated. Prior to swine removal, 19% of the exposed portions of the basin marsh had been damaged by swine and the value of the damage to the sampled portion alone was between \$1.2 and \$4.0 million. After only a year of swine removal, damage was down to 7% with a value between \$235,000 and \$767,000, for a return between \$1.0 and \$3.3 million. The cost of the portion of the control contract directed at the basin marsh was \$2,100, resulting in a large benefit-cost ratio between 480 and 1562.

Monkeypox Outbreak in Ghana Investigated – In March 2004, a scientist from the NWRC was invited to join a team of scientists and epidemiologists (5 from the U.S. Centers for Disease Control and Prevention [CDC]) to investigate monkeypox virus in Ghana. The 2003 outbreak of monkeypox virus in the United States is believed to have started following importation of exotic pet species from Ghana. The joint CDC/USDA investigation involved evaluation of human disease, the search for animal reservoirs, and expansion of laboratory capacity to support in-country disease surveillance. The team worked closely with the Ghana Ministry of Health, the University of Ghana Noguchi Memorial Institute for Medical Research, and the U.S. National Zoo during the 3-week investigation.

Brown-headed Cowbirds Trapped to Protect Kirtland's Warblers – Biologists at the NWRC Sandusky, OH, field station captured 400 brown-headed cowbirds in April 2004 to aid in a cooperative recovery effort for the endangered Kirtland's warbler in Michigan. The trapped cowbirds were used by the USFWS as decoys to lure other cowbirds to traps in areas where warblers nest, thereby reducing the incidence of nest parasitism during May and June. Since 1972, cowbird parasitism has been reduced from over 50% to less than 5% of nests, and the nesting population of warblers has increased from about 180 to over 900 pairs. NWRC has provided the USFWS with cowbirds for this endangered species project annually since 1980. Other cooperating agencies include the Michigan Audubon Society, the Michigan Department of Natural Resources, and the U.S. Forest Service.

GIS Use in Rabies Research – NWRC scientists participated in a joint planning session on May 25, 2004, with the WS' Rabies Coordinator and Rabies Geographic Information Systems (GIS) Specialist. Since 1922, there have been more than 10,000 positive cases of skunk-variant rabies in California, with over 1,200 livestock and 20,000 pet cases of rabies. GIS plots revealed 3 traditional "hot spots" of skunk-variant rabies in the state (i.e., Contra Costa-Alameda, San Luis Obispo-Santa Barbara, and Butte-Yuba-Yucca counties). Strategies were devised to estimate disease impacts and oral rabies vaccine (ORV) costs. Ultimately, scenario and forecast analyses will be provided as decision-making tools for evaluating the potential savings likely to accrue from a skunk-variant rabies ORV program.

INFORMATION AND COMMUNICATION

4th European Vertebrate Pest Management Conference – Several NWRC scientists from Fort Collins, CO, and Gainesville, FL, attended the 4th European Vertebrate Pest Management Conference (EVPMC) held in Parma, Italy, September 9-13, 2003. NWRC scientists presented papers on repellents for deer and herbivores, protection of endangered shorebirds from predators, reduction of invasive monk parakeet damage to electric utilities, and the economics of oral rabies vaccination for wildlife. The EVPMC is an international biennial conference that focuses on pest issues across Europe. More than 140 researchers attended this year's conference including scientists from the United States, New Zealand, and Australia. Key topics covered at the conference involved rock dove populations in urban settings, nutria damage to Italy's crops and waterways, and rodent-borne diseases.

Annual Meeting of the Great Lakes Area Working Group on Colonial Waterbirds – Biologists from the NWRC Starkville, MS, field station participated in the annual meeting of the Great Lakes Area Working Group on Colonial Waterbirds held at Garden Island near Kingston, Ontario, October 7-8, 2003. The mission of the working group is to foster collaboration and discuss ongoing research and research needs for colonial waterbirds in the Great Lakes. NWRC biologists presented updates on studies related to migratory and regional movements of double-crested cormorants captured in the southeastern United States, population dynamics of interior nesting double-crested cormorants, and double-crested cormorant response to hazing on Oneida Lake, NY. Twenty-five other biologists, representing New York and Vermont state agencies and universities, the Canadian government also participated in this meeting.

Puerto Rican Parrot Interagency Policy Committee Meeting – On October 8, 2003, an NWRC scientist from Fort Collins, CO, the WS Florida State Director, and a collaborating scientist from the University of California-Davis attended the Puerto Rican Parrot Interagency Policy Committee Meeting in San Juan, Puerto Rico. The Puerto Rican parrot is one of the world's rarest birds, and the scientists have been collaborating to monitor populations of, and protect the parrots from, 3 species of invasive mammals. Results from indexing populations of rats, mongooses and cats in parrot nesting and foraging habitat were presented to the committee. Predation on parrots by rats and mongooses has been reported during the breeding season in recent years. Rat populations were found to be among the highest reported in the world. Mongooses were also found to be exceptionally abundant, and feral cats were common. Also presented were results of a rat control trial in which a grid of 18 diphacinone bait stations around a parrot nesting tree produced 100% mortality of radio-collared rats. Finally, results were presented on an economic analysis conducted at NWRC that showed that only 1 parrot needs to be saved from predation every 11.8 years for a predator control program to be cost-effective. Based on the information presented, the committee may consider a role for predator control in parrot management.

Oregon Wildlife Commission Meeting – An NWRC Olympia, WA, scientist attended the Oregon Wildlife Commission meeting in Roseburg, OR, on October 10, 2003. The primary objective of the meeting was to address concerns regarding trap check intervals for predators. More than 50 people, representing diverse stakeholder groups including the timber and livestock industries and animal rights advocates, attended the meeting to hear about, and give testimony on, Oregon's predator trapping requirements. The NWRC scientist was recognized by the Commission as the expert in attendance, and was asked to provide extensive testimony on the biology and ecology of mountain beavers and coyotes.

Invasive Coqui Frogs on Hawaiian Television – Researchers from the NWRC Hilo, HI, field station participated in a television filming of “Living in Paradise-Big Island Minute Live” on December 13, 2003. The public community-access cable TV program featured a question and answer segment on invasive coqui frogs, which are spreading rapidly through many neighborhoods in Hawaii. The researchers answered questions posed by students from a local high school on the current status of the frogs on the island of Hawaii, including the frogs’ biology, habitat, accidental introductions to Hawaii, reproductive behavior, and ecological and economic impacts. The researchers also discussed control strategies available to the public to prevent frogs from spreading to other areas. The program aired locally every night during the month of January, 2004.

Washington State Forest Health Program – On December 12, 2003, an NWRC scientist from the Olympia, WA, field station participated in the “Current Topics in Forest Health” program sponsored by the University of Idaho Extension and held in Coeur d’Alene, ID. The program is an annual update for forest owners, loggers, and natural resource professionals on the latest research to improve forest growth and health. The program was attended by approximately 90 natural resource managers. The NWRC scientist covered 2 topics, “Deer Damage in Forestry: Management Alternatives” and “Bear Damage to Young Conifers: Description and Management.” Resource managers were told how to develop a program combining feasible tools and strategies to reduce animal damage. Pertinent recent research activities were also presented.

Wildlife Aviation Research Review – Biologists from the NWRC Sandusky, OH, field station met with FAA representatives on January 21, 2004, to review NWRC research conducted under an USDA-FAA Interagency Agreement and to discuss future research plans. The FAA Wildlife Strike Database, developed and maintained by personnel at the NWRC Sandusky, OH, field station, now includes U.S. Air Force wildlife strikes that occur at joint-use (military and civilian) airbases, bringing the current total of entries to more than 56,000 strikes since 1991. Center biologists also reviewed studies of ElectroBraid™ fencing to exclude deer from selected areas; the use of plant growth regulators to maintain vegetation at a desired height; the use of an almost pure (> 90% cover) fescue for feeding by Canada geese; and the use of planted vegetation plots at selected airports in the Pacific Northwest by insects, birds, and small mammals. NWRC’s future wildlife aviation research likely will focus on determining the features of trash-transfer facilities that attract birds, evaluating ElectroBraid™ fencing to exclude deer from large exclosures, comparing efficacies of avian survey methods at airports, and identifying features of water detention facilities that attract birds.

Ohio Fish and Wildlife Conference Presentations – Biologists from the NWRC Sandusky, OH, field station gave seminars on February 6, 2004, at the 44th Ohio Fish and Wildlife Conference. The conference was sponsored by the Ohio Fish and Wildlife Management Association, the Ohio Chapter of The Wildlife Society, and the Ohio Chapter of the American Fisheries Societies. The annual conference provides a forum for current research on issues related to Ohio’s fish and wildlife resources. The NWRC biologists presented seminars entitled, “Tall Fescue and Wildlife: Good, Bad, or Indifferent?” and “Exploiting Natural Signals to Enhance Avian Visual Repellents and Alerts.” In addition to The Ohio State University students and faculty, the conference was also attended by representatives from Case Western University, Cleveland State University, Hocking Technical Institute, Ohio WS, the Ohio Department of Natural Resources, the USGS, and the Ohio Nature Conservancy.

Tres Rios, Arizona Nature Festival – An NWRC scientist participated in the Tres Rios Nature Festival held March 13 and 14, 2004, at the Estrella Mountain Regional Park, near Phoenix, AZ. The festival was the first of a planned annual event to provide wildlife educational opportunities for area residents. NWRC collaborated with Arizona WS to present information on the North American beaver. A taxidermic mount of a beaver, beaver skulls, footprints and extracted teeth, gnawed tree sections, stems treated with textural repellent, and telemetry equipment, were all available for hands-on experiences. NWRC and WS personnel discussed beaver biology and ecology, along with management approaches and ongoing research. A poster provided written descriptions and pictures depicting the animals, and the costs and benefits derived from their behaviors. Interested participants were given information on WS and the NWRC, and children were offered copies of the “Living with Wildlife” handout on beavers. Several teachers took copies of the beaver handout for use in their classrooms.

21st Annual Vertebrate Pest Conference – Twenty-six researchers from NWRC presented talks at the 21st annual Vertebrate Pest Conference, held in Visalia, CA, on March 1-4, 2004. The meeting, to discuss issues and research in the area of wildlife damage management, was attended by wildlife professionals from the United States and 15 other countries. After the meeting, the NWRC hosted 2 visitors from the Cooperative Research Centre in Australia and 1 visitor from the Central Science Laboratory. Both groups plan to cooperate with the NWRC in future research efforts.

Chemosensory Symposium – On March 22-23, 2004, NWRC scientists from Fort Collins, CO, and Sandusky, OH, traveled to Philadelphia, PA, to attend the annual “Chemosensory Challenges for Industry” symposium held by the Monell Chemical Senses Center (where another NWRC scientist is based). Presentations covered a variety of topics, including several of practical interest to WS. These relevant topics included chemical methods to suppress bitterness and astringency, strategies to suppress malodors and to prevent ammonia production in urine, and fragrance chemicals (such as citrus oil) to mask human scent. Other meeting participants included more than 100 scientists and science managers sent by Monell industrial sponsors.

National Invasive Species Council Meeting – On March 12, 2004, a scientist from the NWRC Hilo, HI, field station presented a seminar to members of the National Invasive Species Council and the Invasive Species Advisory Committee. The seminar was on current research and the role of the field station within the NWRC. The National Invasive Species Council is an inter-departmental council that coordinates federal invasive species activities. Council members include the U.S. Secretaries of the Interior, Agriculture, Commerce, State, Defense, Treasury, Transportation, and Health and Human Services, as well as the Administrators of the USEPA and the U.S. Agency for International Development. The Council actively works with the Invasive Species Advisory Committee, established to advise the federal government on invasive species issues and represent stakeholders.

The FAA Wildlife Strike Database, developed and maintained by personnel at the NWRC Ohio field station, now includes U.S. Air Force wildlife strikes that occur at joint use (military and civilian) airbases, bringing the current total of entries to more than 56,000 strikes since 1991.



NWRC biologists also attended the first public meeting of the Hawaii Invasive Species Council (HISC), a new council consisting of members appointed by the governor to develop policies on invasive species in Hawaii. While the Coordinating Group on Alien Pest Species (CGAPS) has addressed invasive species issues in Hawaii for many years and carried out control measures, HISC provides input on federal invasive species legislation and policies. Members of the council include representatives of the Hawaii Department of Land and Natural Resources, the Hawaii Departments of Agriculture, Transportation and Health, and the University of Hawaii, among others. One of the first legislative actions taken was to provide groups such as CGAPS with power to control invasive species on private property and to protect property owners from liability. Issues concerning the control of established invasive species and the prevention of entry of new invasives will be addressed in future working groups.

Rodent Control in Hawaiian Sugarcane Training Session – A researcher from the NWRC Hilo, HI, field station presented a training session on rodent control in sugarcane at the Hawaiian Commercial & Sugar plantation on the island of Maui on April 6-7, 2004. The scientist discussed the biology and ecology of rodents in sugarcane, damage characteristics, sampling techniques, and current control strategies. The various training sessions, sponsored by the Hawaii Agricultural Research Center (formerly Hawaiian Sugar Planters Association) and the sugarcane plantations, provided field supervisors and crew chiefs with up-to-date information on such things as developing sugarcane varieties, cultivation improvements, pest control, harvesting, milling, and other aspects of growing sugarcane in Hawaii. Future sessions by NWRC staff on rodent damage assessment surveys and controlled field baiting trials have been requested by the plantation managers.

Wildlife Damage Management Class Visit – On April 1-2, 2004, 10 students from a wildlife damage management class at the University of Nebraska-Lincoln (UN-L) visited the NWRC in Fort Collins, CO. The NWRC Director welcomed the class and discussed the history and mission of the Center; scientists from each research program presented their current work. The class also toured the NWRC research campus. In addition, the UN-L class visited the Colorado Division of Wildlife, attended a seminar at Rocky Mountain National Park given by a scientist from the NWRC Logan, UT, field station, and visited an NWRC research study site in Estes Park, CO, where a novel fence for excluding elk is being evaluated. At this site members of the Colorado State University Student Chapter of The Wildlife Society, who are assisting with the study, described their activities and interactions with NWRC.

Nonlethal Predation Management for Wolves Presentation – On April 20, 2004, a scientist from the NWRC Logan, UT, field station presented a talk “Current Development and Future Directions in Nonlethal Predation Management for Wolves” at the Wolf Stewards meeting in Odanah, WI. The conference was attended by approximately 100 people, including members of Wisconsin, Minnesota, and Michigan state agencies, WS operational personnel from several states, and the general public.

Bird Hazard Task Force Meeting – Scientists from the NWRC Sandusky, OH, field station participated in a meeting of the Bird Hazard Task Force at John F. Kennedy International Airport (JFKIA) on March 18, 2004. The scientists updated findings from an

examination of laughing gull dietary patterns and invertebrates inhabiting JFKIA. Preliminary study findings suggest Jamaica Bay laughing gulls forage on a wide variety of foods, most of marine origin (e.g., horseshoe crab eggs). Terrestrial (e.g., insects) and anthropogenic (e.g., French fries) foods are also important. The NWRC scientists also provided an overview of several 2004 research projects to be conducted at JFKIA.

Vertebrate Pest Research Advisory Council Meeting – NWRC scientists from Fort Collins, CO, traveled to Modesto, CA, on April 22, 2004 for a meeting of the Vertebrate Pest Research Advisory Council. The Council funds some NWRC research projects aimed at improving wildlife damage management technology. In attendance were a number of California county agriculture commissioners, WS staff, University of California-Davis researchers, and agricultural producers/growers. Research updates provided by NWRC scientists dealt with (1) a benefit-cost analysis of WS-CA, (2) the development of a reproductive agent to reduce fertility in crows and rodents, and (3) the development of a novel toxicant for coyotes.

West Nile Virus Overview and History in North America – On April 24, 2004, a scientist from the NWRC made a presentation in Golden, CO, on “West Nile Virus Overview and History in North America” at a public forum on “Wildlife Diseases and You” sponsored by the Colorado Wildlife Federation and the National Wildlife Federation. Presentations provided information on West Nile virus and chronic wasting disease on both national and regional issues related to wildlife, domestic animal, and human health.

Double-crested cormorant Management Presentation – Scientists from the NWRC Starkville, MS, field station joined New York WS biologists at the annual meeting of the Oneida Lake Association in Cicero, NY, April 21-22, 2004. The WS biologists presented information and answered questions from local residents on a joint program for conducting research and management on double-crested cormorants that breed in central New York. This meeting serves as an annual forum for natural resource managers to update local citizens, economic development organizations, and environmental interests on work pertaining to the economic and ecological well-being of the Oneida Lake ecosystem. Approximately 350 residents and interested parties attended the event.

Nanawale, HI, Community Fair Booth – Researchers from the NWRC Hilo, HI, field station presented an informational booth at the Nanawale Community Fair in the Puna district of the Big Island on April 24, 2004. Approximately 200 people attended the fair. The NWRC biologists presented ecological and damage control information on invasive rodents, Caribbean tree frogs, brown treesnakes, birds, and mongooses using visual displays, written material, and animal specimens. They also assisted the community coordinator in mapping out coqui frog populations within Nanawale Estates, and gave advice on how to conduct sound surveys to estimate frog densities. The researchers plan to follow up the fair presentation with a presentation to the Nanawale Community Association members and homeowners, focusing on coqui frog biology and how to coordinate frog control within the community.

Wildlife Damage Management for Natural Resource Managers Conference – The NWRC Olympia, WA, field station hosted the conference “Wildlife Damage Management for Natural Resource Managers” in Olympia, WA, April 27-28, 2004. More than 100 persons from 8 states and Canada participated. Nine WS NWRC and Operations experts joined with industry and academic scientists to present materials pertinent



to forest managers for protecting trees from wildlife. One session focused on current status and feasibility of control techniques such as toxicants, repellents, reproductive inhibitors, trapping, habitat modification, alternative food sources, fences, and frightening devices. The next session concerned identification and control of species known to cause damage to forest resources (e.g., beavers, porcupines, rabbits, squirrels, voles, mountain beavers, and deer). A panel discussion revolved around how to respond to wildlife damage issues, and perspectives from the public, wildlife managers, and timber owners were presented. At the end of the presentations and discussions, participants were invited to view both wildlife species and field demonstrations of management techniques for wildlife species, and to talk with technical experts. Participants also were invited to tour the NWRC field station research facilities showcasing experimental work with deer and rodents in both laboratories and controlled natural habitat environments.

FAA Worldwide Airport Technology Transfer Conference – Sandusky, OH, field station scientists presented papers at the biennial meeting of the FAA Worldwide Airport Technology Transfer Conference in Atlantic City, NJ, April 18-21, 2004. The papers were entitled “Providing Techniques to Reduce Wildlife Risks to Aviation” and “Management of Vegetation to Reduce Wildlife Hazards at Airports.” Approximately 200 individuals participated in the meeting in which 42 papers were presented.

Ohio State University Wildlife Biology Students – The NWRC Sandusky, OH, field station, located on the 6,000-acre NASA Plum Brook Station, hosted 35 wildlife biology students from Ohio State University on April 30, 2004. Students toured the station and viewed demonstrations of current research on the physiology of avian vision, identification and necropsy of birds struck by aircraft, use of lasers to disperse birds, habitat manipulation and use of chemicals, evaluating effectiveness of repellents and selected vegetation for deterring Canada geese, electric fencing and other barriers, raccoon rabies, and the forward-looking infrared camera as a survey tool. Students were also lectured on trapping techniques, radiotelemetry, and ecology of river otters in Ohio. Throughout the visit, emphasis was placed on demonstrating to the students the scientific method, the importance of rigorous experimental design, and the integrated research and management approach needed to resolve various conflicts between wildlife and people.

International Conference on Utility Line Structures – An NWRC scientist from Fort Collins, CO, participated in a discussion of woodpecker damage to wood utility poles as part of the International Conference on Utility Line Structures held March 28-31, 2004, in Fort Collins, CO. The group included representatives from several U.S. and Canadian utility companies. The discussions centered on the extent of woodpecker damage to poles, potential products for prevention, control and repair of damage, and current NWRC repellent research on pileated woodpeckers. The group toured the NWRC research campus and saw first hand the amount of damage pileated woodpeckers can do to untreated poles.

Big Dogs and Big Cats: Carnivore Research in North and South America – A scientist from the NWRC Logan, UT, field station presented a lecture entitled “Big Dogs and Big Cats: Carnivore Research in North and South America” on Saturday, April 3, 2004, in Rocky Mountain National Park, CO. This talk was sponsored by the National Park Service as part of the Lyceum Lecture Series focusing on predators. The NWRC scientist discussed research projects examining the interactions of wolves, coyotes, and pronghorn antelope in the Grand Teton National Park area, as well as research investigating relationships among jaguars, native prey, and livestock in Brazil. This lecture was attended by more than 100 persons from the Estes Park and Denver, CO, areas.

Mongoose Management Plan for Hawaii – Small Indian mongooses were introduced to Hawaii Island in 1883 from Jamaica and India by the early sugarcane planters to exterminate rats in sugarcane fields. Subsequent introductions were done on the islands of Maui, Molokai, and Oahu; none was introduced on the island of Kauai, one of the few places in Hawaii where ground-nesting native bird species continue to reproduce successfully. On May 5, 2004, a scientist from the NWRC Hilo, HI, field station gave a presentation on mongoose lures and trapping strategies to agencies concerned with mongooses spreading to Kauai. The group was composed of representatives from the USFWS, WS, the Nature Conservancy, USDA Plant Protection and Quarantine, and Hawaii state and county agencies. The scientist also developed a preliminary management plan for responding to sightings of mongooses on the island. Two documented road-kills of mongooses and numerous credible mongoose sightings have been reported on Kauai over the past 10-15 years. Despite extensive trapping efforts, no individuals have been subsequently observed or captured. The management plan will provide a mechanism for keeping Kauai mongoose-free.

The NWRC scientist discussed research projects examining the interactions of wolves, coyotes, and pronghorn antelope in the Grand Teton National Park area, as well as research investigating relationships among jaguars, native prey, and livestock in Brazil.



VALUING AND INVESTING *IN PEOPLE*

Director Dr. Richard Curnow Retires – After nearly 37 years of federal service, Dr. Richard D. Curnow, NWRC Director, announced his retirement effective April 3, 2004. Dick served as Assistant Director of NWRC from 1977 until 1994 at which time he became the Director. As the Director he spearheaded the planning, construction, establishment, and relocation of the Center from Denver to Fort Collins, CO. Over the years, Dick received added numerous awards and recognitions, including the Federal Energy Saver Showcase Award, the USDA Secretary of Agriculture Honors, and the USDA Special Act Award. Dick was also recognized by the Colorado State University Alumni Association in 2002 as a Distinguished Alumnus of the College of Natural Resources. In retirement, Dick plans to enjoy his new house on the banks of the Poudre River, fish and hunt at every opportunity, and spend time with his family including his two grandsons. We will greatly miss Dick's friendly personality and dedicated and professional leadership.

2003 Publication Award – NWRC Director Richard Curnow presented the 2003 Publication Award to the following NWRC publication: Glahn, J. F.; Dorr, B.; Harrel, J. B.; Khoo, L. 2003. Foraging ecology and depredation management of great blue herons at Mississippi catfish farms. *Journal of Wildlife Management* 66: 194-201. This publication is an excellent example of the quality of research being conducted by NWRC scientists and their collaborators.

Editor's Award – During the week of October, 12, 2003, Dr. Jimmy Taylor, a biologist from the NWRC Starkville, MS, field station, attended the 57th Annual Meeting of the Southeastern Association of Fish and Wildlife Agencies (SEAFWA) in Mobile, Alabama. Dr. Taylor was recognized for his outstanding service as the associate editor for wildlife by the Southeastern Section of The Wildlife Society.

Society of Quality Assurance Chapter President – NWRC Quality Assurance Officer Cathy Bens recently completed her position as President of the Rocky Mountain Chapter of the Society of Quality Assurance. Ms. Bens is also the Newsletter Editor for the Chapter.

Library System Board President – Ms. Diana Dwyer, NWRC Information Specialist, recently completed a term as President of the High Plains Library Service System Governing Board. High Plains Library System provides training and cooperative service support to libraries in northeastern Colorado. Ms. Dwyer is also the Special Library representative on the Colorado Library Consortium Board, a state-wide library system that supports Colorado libraries and their service to Colorado residents.

After nearly 37 years of federal service, Dr. Richard D. Curnow, NWRC Director, announced his retirement effective April 3, 2004.

**United States Department of Agriculture
Animal and Plant Health Inspection Service
Wildlife Services**

National Wildlife Research Center

4101 LaPorte Ave.
Fort Collins, CO 80521-2154
<http://www.aphis.usda.gov/ws/nwrc>

Main Telephone Number

(970) 266-6000
FAX: (970) 266-6032

Information Services

(970) 266-6015
FAX: (970) 266-6010
email: nwrc@usda.gov

Animal Care

(970) 266-6204

Research Programs:

Birds: (970) 266-6133
Mammals: (970) 266-6084
Product Development: (970) 266-6159
Wildlife Disease: (970) 266-6262

NWRC Field Stations

Bismarck, ND
(701) 250-4468
FAX: (701) 250-4408

Gainesville, FL
(352) 375-2229
FAX: (352) 377-5559

Hilo, HI
(808) 961-4482
FAX: (808) 961-4776

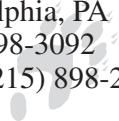
Logan, UT
(435) 797-1348
FAX: (435) 797-0288
Millville, UT Office
(435) 245-6091
FAX: (435) 245-3156

Olympia, WA
(360) 956-3793
FAX: (360) 534-9755

Sandusky, OH
(419) 625-0242
FAX: (419) 625-8465

Starkville, MS
(662) 325-8215
FAX: (662) 325-8704

Philadelphia, PA
(215) 898-3092
FAX: (215) 898-2084



U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Wildlife Services

email: nwrc@usda.gov
[Http://www.aphis.usda.gov/ws/nwrc](http://www.aphis.usda.gov/ws/nwrc)

National Wildlife Research Center
4101 LaPorte Ave.
Fort Collins, CO 80521-2154
(970) 266-6000 Main number
(970) 266-6032 (FAX)
(970) 266-6015 Information Services



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*“Solutions to problems depend upon knowledge
which only research can provide.”*

H. Kalmbach